CLAIMS:

1. A pharmaceutical composition comprising core-shell particles wherein said core-shell particles comprise a core component and a shell component, said particles binding in an animal subject a greater amount of an inorganic ion in the presence of said shell component compared to the amount of inorganic ion bound in the absence of said shell component, wherein said inorganic ion is an anion.

2. The pharmaceutical composition of claim 1 wherein said core component retains a significant amount of said bound inorganic ion during a period of therapeutic and/or prophylactic use.

3. A pharmaceutical composition comprising core-shell particles wherein said core-shell particles comprise a core component and a shell component, said particles binding in an animal subject a greater amount of an inorganic ion in the presence of said shell component compared to the amount of inorganic ion bound in the absence of said shell component and retaining a significant amount of said bound inorganic ion during a period of therapeutic and/or prophylactic use, wherein said inorganic ion is an cation.

4. The pharmaceutical composition of claim 1 or 3 wherein said core component binds a greater amount of an inorganic ion in the presence of said shell component compared to the amount of inorganic ion bound in the absence of said shell component.

5. The pharmaceutical composition of claim 1 or 3 wherein the shell component modulates the movement of said inorganic ion and/or of a competing solute into and/or out of the core-shell particle.

6. The pharmaceutical composition of claim 1 wherein said inorganic ion is a phosphate ion.

7. The pharmaceutical composition of claim 1 wherein said inorganic ion is a chloride ion.

8. The pharmaceutical composition of claim 3 wherein said inorganic ion is a sodium ion.

9. The pharmaceutical composition of claim 3 wherein said inorganic ion is a H^+, potassium ion, calcium ion, iron ion, ammonium ion, or magnesium ion.

10. The pharmaceutical composition of claim 1 or 3 wherein said shell component has a higher permeability for said iorganic ion compared to the permeability for one or more competing solutes.

11. The pharmaceutical composition of claim 10 wherein said permeability of said shell component is modulated by an environment of the gastrointestinal tract.

12. The pharmaceutical composition of claim 10 wherein said permeability of said shell component to said inorganic ion is modified in different environments.

13. The pharmaceutical composition of claim 12 wherein said shell component has increased permeability to said inorganic ion in a first environment and a decreased permeability to said inorganic ion in a second environment.

14. The pharmaceutical composition of claim 10 wherein said permeability of said shell component to said inorganic ion is independent of said permeability of said shell component to said competing solute..

15. The pharmaceutical composition of claim 1 or 3 wherein said core component is physically or chemically attached to said shell component.

16. The pharmaceutical composition of claim 1 or 3 wherein said core component comprises of a metal or a non-metal containing composition.

17. The pharmaceutical composition of claim 1 or 3 wherein said shell component is hydrophobic.

18. The pharmaceutical composition of claim 1 or 3 wherein said shell component exhibits greater interaction with said competing solute compared to said inorganic ion.

19. The pharmaceutical composition of claim 1 or 3 wherein said shell component repels said competing solute.

20. The pharmaceutical composition of claim 1 or 3 wherein said shell component is about 1nm to about 50 μm thick.

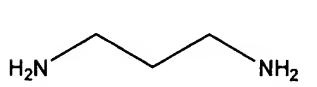
21. The pharmaceutical composition of claim 1 or 3 wherein said core-shell particle is about 200 nm to about 2 mm in size.

22. The pharmaceutical composition of claim 21 wherein said core-shell particle is about 500 μm in size.

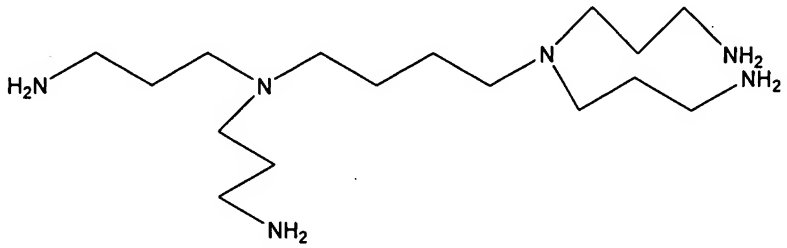
23. The pharmaceutical composition of claim 1 or 3 wherein said core component is selected from the group consisting of optionally crosslinked polyallylamine polymer, polyvinylamine polymer, polyvicinalamine polymer, and polyethyleneimine polymer.

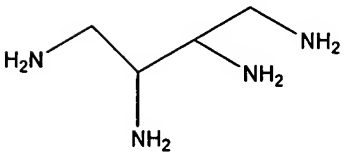
24. The pharmaceutical composition of claim 1 or 3 wherein said core component is a 1,3-diaminopropane/epichlorohydrin crosslinked polymer or a 1,3-diamino propane/1,3-dichloropropane crosslinked polymer.

25. The pharmaceutical composition of claim 1 or 3 wherein said core component comprises an optionally crosslinked polymer, said polymer comprising a repeat unit selected from the group consisting of

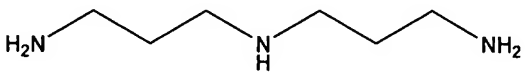


,

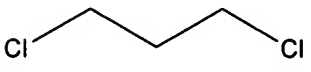




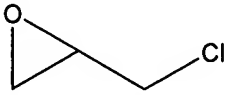
, and



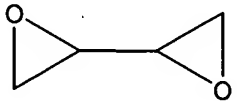
26. The pharmaceutical composition of claim 25 wherein said polymer is crosslinked with a crosslinker selected from the group consisting of



,



, and



27. The pharmaceutical composition of claim 1 or 3 wherein said shell component is synthesized using a material selected from the group consisting of 3-(1H, 1H, 7H-dodecafluoroheptyloxy)-1,2-epoxypropane; glycidyl 4-nonylphenyl ether; glycidyl hexadecyl ether; 2-[(4-nitrophenoxy)methyl]oxirane; poly(bisphenol A-co-

epichlorohydrin), glycidyl end-capped; and poly(o-cresyl glycidyl ether)-co-formaldehyde).

28. The pharmaceutical composition of claim 27 wherein said core component comprises an amine containing polymer and said material used to synthesize said shell chemically reacts with said amine in said core component.

29. The pharmaceutical composition of claim 1 or 3 wherein said shell component is deposited with a coating process.

30. The pharmaceutical composition of claim 1 or 3 wherein said shell component comprises an enteric coating.

31. The pharmaceutical composition of claim 1 or 3 wherein said core component comprises a 1,3-diaminopropane/1,3-dichloropropane crosslinked polymer and said shell component is synthesized using a material selected from the group consisting of 3-(1H, 1H, 7H-dodecafluoroheptyloxy)-1,2-epoxypropane; glycidyl 4-nonylphenyl ether; glycidyl hexadecyl ether; 2-[(4-nitrophenoxy)methyl]oxirane; poly(bisphenol A-co-epichlorohydrin), glycidyl end-capped; and poly(o-cresyl glycidyl ether)-co-formaldehyde).

32. The pharmaceutical composition of claim 1 or 3 wherein said core component comprises an epichlorohydrine crosslinked polyallylamine polymer and said shell component comprises a block copolymer, said block copolymer comprising a hydrophobic block and an amine reactive hydrophilic block.

33. The pharmaceutical composition of claim 32 wherein said hydrophobic block comprises at least one of poly(n-butyl acrylate-co-t-butyl acrylate) or poly(N,N-di-n-butyl acrylamide-co-t-butyl acrylate) and said amine reactive block comprises poly-(N,N-dimethylacrylamide-co-glycidyl methacrylate).

34. A method of treating an animal subject, comprising administering to an animal subject in need thereof an effective amount of the pharmaceutical composition of claim 1 or 3.

35. The method of claim 34 wherein said pharmaceutical composition removes phosphate from a gastrointestinal tract.

36. The method of claim 35 wherein said animal subject is suffering from a disease selected from the group consisting of hyperphosphatemia, hypocalcemia,

hyperparathyroidism, depressed renal synthesis of calcitriol, tetany due to hypocalcemia, renal insufficiency, ecotopic calcification in soft tissues, and ESRD.

37. The method of claim 34 wherein said pharmaceutical composition removes sodium ions from a gastrointestinal tract.

38. The method of claim 37 wherein said animal subject is suffering from hypertension, chronic heart failure, end stage renal disease, liver cirrhosis, chronic renal insufficiency, fluid overload, or sodium overload.

39. The method of claim 34 wherein said pharmaceutical composition removes potassium ions from a gastrointestinal tract.

40. The method of claim 39 wherein said animal subject is suffering from at least one of hyperkalemia, metabolic acidosis, renal insufficiency, or anabolic metabolism.

41. A method of removing phosphate from an animal subject, comprising administering to an animal subject in need thereof an effective amount of the pharmaceutical composition of claim 1.

42. A method of removing phosphate from an animal subject suffering from a phosphate imbalance disorder comprising administering to an animal subject in need thereof an effective amount of a core-shell composition, wherein said core-shell composition comprises core-shell particles, said core-shell particles comprising a core component and a shell component, said core component capable of binding a greater amount of phosphate in the presence of said shell component compared to the amount of phosphate bound in the absence of said shell component.

43. The method of claim 42 wherein the core component comprises aluminum carbonate, aluminum hydroxide gel, calcium carbonate, calcium acetate, or lanthanum carbonate.

44. A method of removing phosphate from an animal subject suffering from a phosphate imbalance disorder comprising administering to an animal subject in need thereof an effective amount of a core-shell composition, wherein said core-shell composition comprises core-shell particles, said core-shell particles comprising a core component and a shell component, wherein said core component comprises a 1,3-diaminopropane/1,3-dichloropropane crosslinked polymer and said shell component is synthesized using a material selected from the group consisting of 3-(1H, 1H, 7H-

dodecafluoroheptyloxy)-1,2-epoxypropane; glycidyl 4-nonylphenyl ether; glycidyl hexadecyl ether; 2-[(4-nitrophenoxy)methyl]oxirane; poly(bisphenol A-co-epichlorohydrin), glycidyl end-capped; and poly(o-cresyl glycidyl ether)-co-formaldehyde).

45. A method of removing phosphate from an animal subject suffering from a phosphate imbalance disorder comprising administering to an animal subject in need thereof an effective amount of a core-shell composition, wherein said core-shell composition comprises core-shell particles, said core-shell particles comprising a core component and a shell component, wherein said core component comprises epichlorohydrine crosslinked polyallylamine polymer and said shell component comprises a block copolymer, said block copolymer comprising a hydrophobic block and an amine reactive hydrophilic block.

46. The method of claim 45 wherein said hydrophobic block comprises at least one of poly(n-butyl acrylate-co-t-butyl acrylate) or poly(N,N-di-n-butyl acrylamide-co-t-butyl acrylate) and said amine reactive block comprises poly-(N,N-dimethylacrylamide-co-glycidyl methacrylate).

47. A pharmaceutical composition comprising core-shell particles wherein said core-shell particles comprise a core component and a shell component, said core component binding a greater amount of sodium in the presence of said shell component compared to the amount of sodium bound in the absence of said shell component and retaining a significant amount of said bound sodium during a period of therapeutic and/or prophylactic use.

48. A pharmaceutical composition comprising core-shell particles wherein said core-shell particles comprise a core component and a shell component, said core component binding a greater amount of chloride in the presence of said shell component compared to the amount of chloride bound in the absence of said shell component.

49. A pharmaceutical composition comprising core-shell particles wherein said core-shell particles comprise a core component and a shell component, said core component binding a greater amount of phosphate in the presence of said shell component compared to the amount of phosphate bound in the absence of said shell component.

50. The pharmaceutical composition of claim 1, 3, 42, 44, 45, 47, 48, or 49 wherein the core component is present in an amount less than the amount administered to an animal subject in the absence of the shell component.